Genital Sexual Arousal Patterns of Transgender Men

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Abstract

Most men show genital sexual arousal to one, preferred gender. Most women show genital arousal to both genders, regardless of their sexual preferences. There is limited knowledge whether this difference is driven by biological sex or gender identity. Transgender individuals, whose birth sex and gender identity are incongruent, provide a unique opportunity to address this question. We tested whether the genital responses of 25 (female-to-male) transgender men followed their female birth sex or male gender identity. Depending on their surgical status, arousal was assessed with penile gauges or vaginal plethysmographs. Transgender men's sexual arousal showed both male-typical and female-typical patterns. Across measures, they responded more strongly to their preferred gender than other gender, similar to (but not entirely like) 145 cisgender (non-transgender) men. However, they still responded to both genders, similar to 178 cisgender women. In birth-assigned females, both gender identity and biological sex may influence sexual arousal patterns.

Statement of Relevance

People who are transgender identify as male but were born with female bodies, or vice versa. Relatively little is known about how transgender identification translates into behavior generally and into sexual responsiveness in particular. That is, do transgender people behave in line with their birth sex, or in line with the gender they identify as? Because most men and women differ substantially in their sexual responses to erotic videos showing males or females, we used these sexual responses to tell us whether a person behaves in a male-typical or female-typical way. We found that even though transgender men (that is, female-to-male transgender) had some female-typical responses, in line with their female birth sex, they also showed striking male-typical responses, in line with their male gender identity. Hence, for transgender men, their physiological sexual arousal is in part reflective of their male identity.

Genital Sexual Arousal Patterns of Transgender Men

In cisgender, a female birth sex matches a gender identity of woman, and a male birth sex matches a gender identity of man. There is a consistent difference between cisgender men and women in the specificity of their genital sexual arousal to sexual stimuli, measured with either a penile strain gauge or vaginal plethysmograph. Most cisgender men show genital sexual arousal to one, preferred gender, but not to the other gender, whereas most cisgender women show arousal to both genders, regardless of self-reported sexual preferences (Bailey et al., 2016). There are exceptions to this general sex difference. For instance, in cisgender men, sexual responses to one, preferred gender is more pronounced in heterosexual and homosexual men than bisexual men (Jabbour et al., 2020). Another exception to the general sex difference is among cisgender women. Even though homosexual women are, like heterosexual women, sexually aroused to both genders, they also respond, unlike heterosexual women, somewhat more strongly to their preferred gender than the other gender (Rieger, Savin-Williams, Chivers, & Bailey, 2016). In general, however, specific sexual arousal to a preferred gender characterizes men more than women and can therefore be considered male-typical, whereas non-specific arousal to both genders can be considered female-typical (Bailey, 2009; Chivers, Seto, & Blanchard, 2007).

Because the majority people are cisgender, their birth sex and gender identity are strongly correlated (Zucker, 2017). Thus, for most people, it is unknown whether sex differences in their sexual arousal are linked to their birth sex or gender identity. However, the very existence of transgender individuals suggests that birth sex and gender identity do not have to match, and in theory, one or the other could be more relevant for the organization of sexual arousal. The literature often focuses on birth sex (Bailey, 2009), but gender identity could also be influential.

Gender identity is a component of social identity that affects the sense of self, treatment by others, and the ascription of social roles (Eagly & Wood, 2017). Furthermore, because gender identity is so central to the self, it can cause individuals distress if their gender identity is not correctly expressed: transgender people can experience gender dysphoria until their physical sex becomes aligned with their gender identity (de Vries et al., 2014; Murad et al., 2010). Given the relevance of gender identity to the self, it is informative to understand its potential contributions to sexual arousal, independent of birth sex.

Moreover, through a focus on transgender individuals, the study on sexual of arousal can aid in understanding the identity of those who are transgender. There are several stereotypical and stigmatizing beliefs about transgender individuals (Howansky, Wilton, Young, Abrams, & Clapham, 2019). For instance, one public perception is that transgender men (i.e., female-to-male) are indistinguishable from homosexual cisgender women (Kiss, 2018), or that transgender men have to be attracted to women, which might make transgender men with attractions to men doubt their own gender identity (Bockting, Benner, & Coleman, 2009). A study of transgender men's physiological sexual arousal could help supporting the notion of their gender identities and their sexual attractions.

Transgender people have rarely been studied in this context. One reason for this is that the estimated population size is small, ranging from 0.3% to 1.3 (Zucker, 2017). One study examined the genital sexual arousal patterns of postoperative transgender women (i.e., male-to-female) with vaginal photoplethysmographs. Transgender women's arousal was specific towards their preferred gender, similar to the patterns in cisgender men, and unlike the patterns in cisgender women (Chivers, Rieger, Latty, & Bailey, 2004). Thus, in people with a male birth sex, sexual arousal patterns might not be driven by their gender identity but by their birth sex.

Sexual responses of transgender men have not been studied, and because of the difference in specificity between cisgender men and women, it cannot be assumed that transgender men have sexual responses that are either equivalent to, or opposite from, those of transgender women. Thus, one aim of the present study was to examine whether the arousal patterns of transgender men reflects their gender identity (gender-specific sexual arousal like most men), or their birth sex (gender-nonspecific sexual arousal like most women).

Gender identity relates to appearance, behavior, and cognition; for example, transgender men are in this respect more male-typical than most cisgender women, starting in childhood (Olson & Gülgöz, 2018; Olson, Key, & Eaton, 2015; Singh et al., 2010; Zucker et al., 2012). Transgender men could therefore be more male-typical than cisgender women in other ways, including their physiological sexual arousal patterns. That is, if, like behavior, genital sexual arousal is associated with gender identity, transgender men might show male-typical arousal, consistent with their male identity. Therefore, they may show substantial sexual arousal to their preferred gender but not the other gender, similar to cisgender men. However, because one study found that transgender women have male-typical arousal (Chivers et al., 2004), it could mean that for transgender people, in general, birth sex has a primary influence on their sexual arousal patterns. Therefore, transgender men could have female-typical genital arousal, and be sexually aroused to both genders, in line with their female birth sex. Furthermore, transgender men could show a combination of male-typical and female-typical patterns. That is, similar to homosexual cisgender women, who are female-typical in their sexual arousal because of their responses to both genders, but also male-typical in the sense that they respond more to their preferred gender than the other gender (Rieger et al., 2016), it could be that transgender men show such combination of male-typical and female-typical responses.

A further question of the present research was how genital sexual arousal can be measured in transgender men. Around 2% of transgender men undergo a surgery called metoidioplasty (James et al., 2016), which releases the clitoris, enlarged by testosterone, from the suspensory ligament. The penis created by this procedure is 1-3 inches in length and enlarges during arousal (Cotten, 2012). It may therefore be viable to measure arousal in postoperative transgender men using a smaller-sized penile strain gauge. As this surgery is rare, in the present study, 6 transgender men have had metoidioplasty, whereas 19 had not. We therefore measured the genital sexual arousal of transgender men with either a penile strain gauge or a vaginal plethysmograph, depending on surgical status. Using different measures within the same birth sex allowed for the investigation into potential differences in genital sexual arousal responses due to differences in measurement technique.

In sum, we predicted that:

1) Cisgender men will be more gender-specific in their sexual arousal patterns than cisgender women.

Furthermore, based on the available literature, one, or both, of the following patterns could be detected:

2) Transgender men will show male-typical sexual arousal with stronger sexual responses to the preferred gender than the other gender, similar to cisgender men.

3) Transgender men will show female-typical sexual arousal, with sexual responses to both genders, similar to cisgender women.

In addition, we explored the utility of a penile gauge instead of a vaginal probe in measuring genital sexual arousal of transgender men.

Method

This research was approved by the institutional ethics committee and was carried out in accordance with the provisions of the World Medical Association Declaration of Helsinki. The experiments reported in this article were not preregistered. Requests for the data can be sent via email to the senior author. For an explanation of additional measures that were not included in the present report, please see supplementary material (SOM-R1).

Participants

Participants were recruited via UK Pride festivals, university mailing lists and fairs, and online forums for transgender men (e.g., on Tumblr). Whether participants were transgender was assessed with separate questions about gender identity, birth sex, and whether the two differed. This was initially recorded through a survey and confirmed during the visit to the lab.

Participants consisted of 25 transgender men, 6 of which used a small penile gauge and 19 used the vaginal probe. Self-reported sexual attraction to men and women was assessed with a 7-point scale (Kinsey, Pomeroy, & Martin, 1948). A score of 0 or 1 meant exclusive or almost exclusive attraction to women (n = 5), scores of 2, 3 or 4 stood for varied degrees of bisexual attractions (n = 16), and a score of 5 or 6 for almost exclusive or exclusive attraction to men (n = 4). Three transgender participants took part twice, due to their interest in another assessment. Because these participants are rare, we did not immediately exclude their second assessments, but rather, analyzed data in different ways: first, by including participant as a random effect to account for the repeated measures of these three participants; second, by excluding the second assessment of these three participants (and not using participant as a random effect). The inclusion or exclusion of their repeated participation did not alter findings (see Results).

Cisgender participants reported a gender identity that was congruent with their birth sex. A total of 178 cisgender women and 145 cisgender men participated during the same time frame

as transgender participants. Their sexual attraction was assessed with identical scales as for transgender participants (Kinsey et al., 1948). A score of 0 or 1 meant exclusive or almost exclusive attraction to women (60 cisgender women, 74 cisgender men), 2 to 4 stood for varied degrees of bisexual attractions (39 cisgender women, 28 cisgender men), and 5 or 6 meant almost exclusive or exclusive attraction to men (79 cisgender women, 43 cisgender men).

For cisgender men, the relationship (standardized regression coefficient β) of their sexual attraction with their genital sexual arousal to male or female sexual stimuli falls between .80 and .90 (Rieger, et al., 2015; Watts, et al., 2018). Thus, significant power of .80 can be achieved with a minimum of 9 cisgender men with different sexual attractions. The present study exceeded this minimum number. For cisgender women, the corresponding effect is low, approximately .20 (Rieger et al., 2016). For this weak effect, the relationship of their sexual attraction with their genital response to male or female stimuli is often not significant, and a focus may be given on the expected magnitude of effect rather than on level of significance. In fact, to achieve significant power of .80 for this effect, it requires a minimum of 193 cisgender women with varied sexual attractions. We aimed to achieve this minimum number but fell 15 participants below (results for cisgender women were still significant in predicted directions). Finally, prior data from our lab indicate that the sex difference in effect (i.e., the interaction of sexual attraction with sex, predicting genital response to males or females) has a magnitude of $\beta = .23$. For this interaction, a minimum of 173 cisgender men and women with varied sexual attractions were needed to achieve significant power of .80. The present sample exceeded this number.

Given these power analyses, if one assumes that transgender men show sexual attractions effects like cisgender men, then a minimum of 9 transgender men with varied sexual attractions are required. Our sample of 25 transgender men with different sexual attractions exceeded this

minimum. However, if one assumes that transgender men show sexual attraction effects like cisgender women, a minimum number of 193 is required. Our sample was below that minimum. Yet, as aforementioned, sexual attraction effects in cisgender women are weak, and it may be more insightful to focus on the expected magnitude and direction of effect rather than level of significance. Furthermore, transgender men willing and able to come to a lab are drawn from a small population and therefore difficult to find. For this reason, it is scientifically informative to examine their physiological sexual arousal patterns, even if their numbers are small.

There was no pre-specified target number of transgender participants. However, once we realized that we had maxed out our opportunities to recruit transgender men (in addition to cisgender women of different sexual attractions, for whom we calculated a large number to achieve powerful effects), we stopped. For consistency in methodology, all cisgender men that were recruited in the same time frame as transgender men and cisgender women were included in analyses, even if their numbers exceeded the number set by above power analyses.

Mean (SD) ages for transgender men, cisgender men, and cisgender women were 22.88 (3.70), 24.67 (9.47), and 24.37 (7.23), respectively. Group did not significantly differ in age, $F(2,345) = .65$, $p = .52$, R^2 [95%CI] = .004 [-.009, .02]. In transgender men, 88% were white and 12% of other ethnicities. In cisgender men 83% were white, and in cisgender women 77%. Groups did not significantly differ in these proportions, $\chi^2(2) = 2.82$, $p = .24$.

Materials and Measures

Sexual Attraction. Two Kinsey-type 7-point scales were used (Kinsey et al., 1948), which participants completed upon arrival in the lab. One scale asked about sexual attraction, raining for exclusive attraction to the opposite gender (a score of 0), to degrees of bisexual attractions with the midpoint being equal bisexual attractions (a score of 3), to exclusive

attraction the same gender (a score of 6). The other scale asked other about sexual orientation identities, ranging from exclusively heterosexual (a score of 0), to bisexual (a score of 3), to exclusively homosexual (a score of 6) orientations (see SOM-R2 for exact phrasing). Measures were highly correlated. In cisgender men, attraction to the opposite gender (women) corresponded with a heterosexual orientation and attraction to the same gender (men) with a homosexual orientation; $r(144) = .98$, $p < .0001$, 95% CI = [.98, .99]. Conversely, in cisgender women, attraction to the opposite gender (men) corresponded with a heterosexual orientation, and attraction to the same gender (women) with a homosexual orientation; $r(176) = .97$, $p < .0001$, 95% CI = [.96, .98]. In transgender men (who have a male identity), correlations were as in cisgender men, with an attraction to the opposite gender (women) corresponding with a heterosexual orientation and attraction to the same gender (men) with a homosexual orientation; $r(23) = .93$, $p < .0001$, 95% CI = .[84, .97]. Cisgender women's responses were reverse-scored. Response were then averaged for each participant. Thus, for each group, higher average scores meant stronger attraction and orientation towards men. This composite score is, from here on, described as "sexual attraction to men or women."

Stimuli. Sexual videos were 3 minutes long, with 3 featuring a male model and 3 featuring a female model masturbating. These stimuli had been previously selected to be the most arousing videos from a large pool (Rieger et al., 2015). Baseline arousal was assessed using six 2-minute clips without any sexual content taken from a nature documentary. These clips have been verified to facilitate a return to an unaroused level (Rieger et al., 2015). Videos were presented full screen with a resolution of 768 by 536 pixels.

Genital Data. Genital responses were recorded every 5 milliseconds using a BIOPAC MP100 data acquisition unit and the program AcqKowledge. A vaginal photoplethysmograph

measured change in vaginal pulse amplitude in cisgender women and preoperative transgender men. The amplitude signal was sampled at 200 Hz, and high-pass filtered at 0.5 Hz with 16 bits resolution. Amplitude was measured as peak-to-trough amplitude for each vaginal pulse.

Penile responses of cisgender men and postoperative (metoidioplasty) transgender men were measured with a penile strain gauge, as the phallus created from the enlarged clitoris is homologous to a cisgender penis. The signal was sampled at 200 Hz, low-pass filtered to 10 Hz and digitized with 16 bits resolution. Most gauges for cisgender men were 70 mm in circumference. Gauges for transgender men were 50 mm in circumference. Before sessions, gauges were calibrated with a cone to assess circumference increase in 5-mm steps. Signals were transformed into millimeters of circumference.

Procedure

This research was reviewed and approved by the institution's Ethics Committee. Written consent was obtained from participants before seating them in a booth, where they faced a screen with a resolution of 1024 by 768 pixels. Participants were briefed how to handle measurement devices, and were then left in privacy for the remainder of the study. Once the genital device was in place, they were instructed via an intercom to keep their eyes on the screen regardless of whether they liked the content or not. Firstly, participants viewed a neutral stimulus, followed by sexual stimuli alternating with nature scenes, playing in a randomized order. The procedure took approximately 45 minutes.

Analyses of genital data were conducted in ways that have previously produced reliable results (Watts, Holmes, Raines, Orbell, & Rieger, 2018). Response to each stimulus was averaged within participants, and these averages were *z*-scored within participants. Next, standardized responses to the 10 seconds preceding a sexual stimulus (at the end of a neutral

stimulus and at which time they had returned to baseline) were subtracted from the standardized response to this stimulus. Then, for each participant, we computed an average response to all male stimuli, and separately, to all female stimuli. These average responses were then used to create a contrast score for each participant. Positive numbers indicated stronger genital responses to males, and negative numbers indicated stronger responses to females.

A further arousal score was computed to measure level of bisexual arousal, by examining average arousal to female stimuli and to male stimuli and by selecting for each participant the lower of the two responses, as compared to baseline. This created a new variable representing participants' responses to their less-arousing gender. Stronger responses to the less-arousing gender indicate more bisexual arousal in a participant. Cisgender women usually respond more strongly to their less-arousing gender than cisgender men, consistent with the observation that cisgender women are more bisexual in their response, on average (Rieger et al., 2015). Response to the less-arousing gender therefore appeared useful to examine the degree of male-typical or female-typical arousal patterns of transgender men.

Results

For differences between transgender men, cisgender men, and cisgender women in variables, and correlations within each group, see supplementary material SOM-R3.

Differences between Transgender Men and Cisgender Men and Women

We predicted that among cisgender participants, men would show more male-typical (gender-specific) sexual arousal than women, whereas women would show more female-typical (gender-nonspecific) sexual arousal. We further examined whether transgender men could show male-typical genital sexual arousal patterns, similar to cisgender men, if they could show female-

typical arousal pattern, similar to cisgender women, or a combination of male-typical and female-typical patterns.

At first, we computed three multiple regression analyses, one for each group: transgender men, cisgender men, and cisgender women. The dependent variable was the genital sexual arousal contrast score. Negative numbers meant stronger sexual responses to females, and positive numbers stronger responses to males, and this across all groups. The independent variable was self-reported sexual attraction, with lower numbers meaning more attraction to women and higher numbers meaning more attraction to men, also across all groups. In the case of transgender men, we computed a mixed-effects regression analysis to account for repeated measures of three participants. Results indicated a main effect of transgender men's sexual attraction on their sexual responses to males or females, B [95% CI] = .34 [.12, .57], p = .005, β [95% CI]= .61 [.29, .93]. (B is the unstandardized and β the standardized regression coefficient.) This finding means that transgender men who reported stronger attractions to women had greater genital responses to females, whereas those who reported stronger attractions to men responded more strongly to males. The corresponding effect was stronger in cisgender men, B = .50 [.44, .55], p < .0001, β = .83 [.74, .92], and weaker in cisgender women, B =.07 [.01, .12], p = .02, β = .18 [.03, .32] (Figure 1A-C). Thus, in each group, sexual attraction to men or women related positively to genital response to males or females, and for this effect, transgender men were between cisgender men and cisgender women.

We then conducted an additional regression analysis to test for a potential difference in effect between transgender men, cisgender men, and cisgender women, again predicting genital sexual arousal to males or females by sexual attraction. Further predictors were participant group (transgender men, cisgender men, cisgender women) and the interaction of sexual attraction with

group. This interaction was significant, B = -.22 [-.25, -.18], p < .0001, β = -.42 [-.50, -.35], suggesting that the relationship of sexual attraction with genital sexual arousal to males or females differed by group. Specifically, for cisgender men the effect of their sexual attraction on their arousal to males or females was significantly stronger than the average effect (taken across all groups), B = .19 [.11, .27], p < .0001, β = .37 [.21, .53]. In contrast, for transgender men the effect was not significantly different from the average effect, B = .05 [-.09, .20], p = .46, β = .08 [-.13, .29]. For cisgender women this effect was smaller than the average effect, B = -.24 [-.32, -.16], p < .0001, β = -.45 [-.60, -.30]. These results confirm the findings illustrated in Figure 1: Transgender men's arousal was shifted in a male-typical direction, because they were more aroused to their preferred gender than other gender. This effect was not as strong as in cisgender men, but stronger than in cisgender women.

We note in Figure 1B that one of the repeatedly-measured transgender men had a change in self-reported sexual attraction (from Kinsey 1 to 5), and this was reflected in a change in arousal. Excluding the second sessions of these repeated participants, the overall effect of transgender men’s sexual attraction on their arousal patterns remained similar to the one reported above, B = .35 [.14, .56], p = .002, β = .59 [.24, .94].

To further test the degree to which transgender men's arousal was shifted in a male-typical or female-typical direction, we examined group differences in their responses to the less-arousing gender, which was our index of bisexual arousal. On average, cisgender men had the weakest responses to their less-arousing gender, M [95% CI] = .24 [.17, .31], although a one-sample t-test indicated that their responses still exceeded baseline (zero), $t(144) = 6.70$, p < .0001, dz = .56 [.45, .68]. Transgender men had stronger responses to their less-arousing gender, compared to baseline, M = 1.02 [.66, 1.39], $t(24) = 5.83$, p < .0001, dz = 1.16 [.91, 1.46].

Cisgender women had the strongest responses, M = 1.29 [1.20, 1.38], $t(177) = 27.95$, $p < .0001$, $dz = 2.08$ [1.98, 2.19] (Figure 2A-C).

Based on prior work, bisexual individuals may respond more strongly to their less-arousing sex than those with exclusive attraction to men or women (Rieger et al., 2015). Bisexuality was not the main focus of the present research, but it was important to statistically control for such a pattern. This can be tested with the quadradic effect of sexual attraction on the response to less-arousing sex: Participants in the mid-range (bisexual range) of the Kinsey scale could have greater responses to their less-arousing sex, and thus, greater bisexual responses, than those who are on either end of the Kinsey scale (exclusively attracted to women or men).

Regression analyses suggested that the groups differed in the quadratic relationship of sexual attraction with bisexual arousal, which is visualized in Figures 2A-C. In cisgender men, those with bisexual attractions had greater bisexual responses than those attracted to women only or men only; this quadratic effect of sexual attraction was significant, $B = -.04$ [-.06, -.01], $p = .001$, $\beta = -.36$ [-.58, -.14]. No such quadratic effect of sexual attraction on bisexual response was found in cisgender women, $B = .03$ [-.003, .06], $p = .07$, $\beta = .15$ [-.01, .31], and transgender men, $B = -.04$ [-.21, .12], $p = .60$, $\beta = -.10$ [-.50, .31]. A further regression analysis indicated that, when controlling for these differences in the quadratic effect of sexual attraction, average group differences in bisexual response remained significant. Cisgender men showed lower than the average bisexual responses (averaged across all groups), $B = -.46$ [-.63, -.28], $p < .0001$, $\beta = -.56$ [-.78, -.33], transgender men had greater bisexual responses, compared with the average response, $B = .23$ [.01, .44], $p = .04$, $\beta = .19$ [.01, .37], and ciswomen also had greater bisexual responses, $B = .22$ [.05, .38], $p = .009$, $\beta = .29$ [.07, .51].

Overall, results indicated that transgender men were relatively more male-typical than cisgender women in their genital sexual arousal because they showed stronger responses to their preferred gender, but still more female-typical than cisgender men because of their levels of bisexual arousal. Cisgender men and cisgender women differed in the predicted way.

Penile Gauge and Vaginal Probe Measures in Transgender Men

A further component of the present research was investigating the use of a penile gauge or vaginal probe in transgender men. For transgender participants only, we conducted a mixed-effects regression analysis, with genital sexual arousal to males or females as the dependent variable, and sexual attraction and measurement device (vaginal probe or penile gauge) as the independent variables. We also tested for an interaction between sexual attraction and device. Participants were a random effect to account for repeated measures of three participants.

Results showed a significant effect of sexual attraction, B = .36 [.14, .58], $p < .003$, β = .63 [.30, .97], no significant effect of device, B = -.23 [-.99, .52], p = .52, β = -.12 [-.45, .22], and no significant interaction of sexual attraction with device, B = -.17 [-.70, .37], p = .52, β = -.10 [-.44, .24]. Thus, across measures, transgender men had male-shifted arousal patterns as their arousal to males or females was linked to their self-reported attraction. When excluding the second session for the three participants who took part twice, both the main effect for sexual orientation, B = .36 [.14, .58], p =.003, β = .60 [.24, .97], and device, B = -.17 [-.95, .60], p = .64, β = -.08 [-.45, .28], remained similar, as did the interaction, B = -.16 [-.71, .39], p = .56, β = -.10 [-.47, .26].

To further examine the effects of each measurement device, we computed additional mixed-effects regression analyses, separately for each device, predicting sexual arousal patterns by sexual attraction. For the 19 participants using the vaginal probe, their self-reported attraction

correlated with their genital sexual arousal to males or females, B = .33 [.04, .63], p = .03, β = .59 [.20, .98]. This effect was not significant in the 6 participants using the penile gauge, B = .48 [-.16, .1.13], p = .10, β = .73 [-.06, 1.52], even though their effect was larger in magnitude than for those using the vaginal probe. Overall, with both measures there were correspondences of transgender men's self-reported sexual attractions with their sexual arousal patterns (Figure 3A-B). When excluding the second session for the three participants who took part twice, both the effect for the vaginal probe, B = .33 [.08, .58], p = .01, β = .55 [.13, .98], and the penile gauge, B = .48 [-.16, 1.22], p = .10, β = .72 [-.24, 1.68], remained similar to those reported above.

Discussion

Present findings suggested the existence of both male-typical and female-typical sexual arousal patterns in transgender men, because they showed some gender-specific sexual arousal, similar to cisgender men, but also showed bisexual arousal, similar to cisgender women.

Due to the small population of transgender men (Zucker, 2017), the sample of transgender men was small, and reduced further by the intrusive nature of the experiment. Insofar, we consider it notable that we were able to recruit 25 transgender men. However, their small sample is a limitation of this work and our following interpretations are tentative.

Present findings differed from results of a previous study that investigated genital sexual arousal in transgender women, and who showed patterns typical for their male birth sex, and atypical for their female gender identity (Chivers, Rieger, Latty, & Bailey, 2004). In our sample of transgender men, arousal patterns were at least partially in line with their male gender identity. This included that transgender men who reported attraction to women were indeed sexually aroused by women, and those attracted to men were indeed aroused by men. This makes these two groups of transgender men distinct from each other, in addition to each group being distinct

from cisgender women of different sexual attractions. Hence, neither should transgender men be dismissed as being "lesbians in denial" (Kiss, 2018), nor should those who report attractions to men being dismissed as not having a male gender.

Another component of the present study was the use of different arousal measures for transgender men. Penile gauges appeared to capture arousal in postoperative transgender men, and did not lead to different patterns of sexual responses as compared to transgender men using the vaginal probe. We stress that the number of transgender men using a penile gauge was small, and no firm conclusions can be made. Still, some speculation is useful. If one assumed that findings were valid, it would suggest that the arousal functions of a penis created through metoidioplasty are similar to those of cisgender penises. This interpretation, too, would verify the male-typicality of transgender men. Furthermore, because transgender men using the vaginal probe and those using the penile gauge had similar arousal patterns, it suggests that different measurement devices do not inherently result in different responses. Cisgender men and women often use different measurement devices and repeatedly show different arousal patterns (Chivers, 2017). The present findings indicate that the vaginal probe can pick up gender-specific arousal patterns in birth sex females, which suggests that it is not a matter of the device that leads to gender-nonspecific arousal patterns in cisgender women. This conclusion is in line with emerging work using alternative measures of sexual arousal that confirm that sexes differ in the gender-specificity of their sexual responses, such as genital thermography (Huberman & Chivers, 2015), or clitoral responses (Suschinsky, Dawson, & Chivers, 2020).

Future research should test a larger sample of transgender men with more equal distribution of sexual attraction, measurement type, and transition stage. In the present sample, 20 participants used testosterone supplements, whereas 5 did not. We could not detect reliable

differences in effect, depending on the use of testosterone (results not shown), but because the latter group was so small, this null finding may not be reliable. Further work should also consider other factors that could affect transgender men's sexual arousal patterns, including the types of sexual stimuli used, or their history of male and female romantic and sexual partners.

In conclusion, transgender men appear to show a combination of male-typical and female-typical genital sexual arousal patterns. These results indicate that for birth-assigned females, differences in sexual arousal may not be solely based on their natal sex, but their gender identity also has an influence. In other words, for transgender men, their physiological sexual arousal is at least in part reflective of their gender identity.

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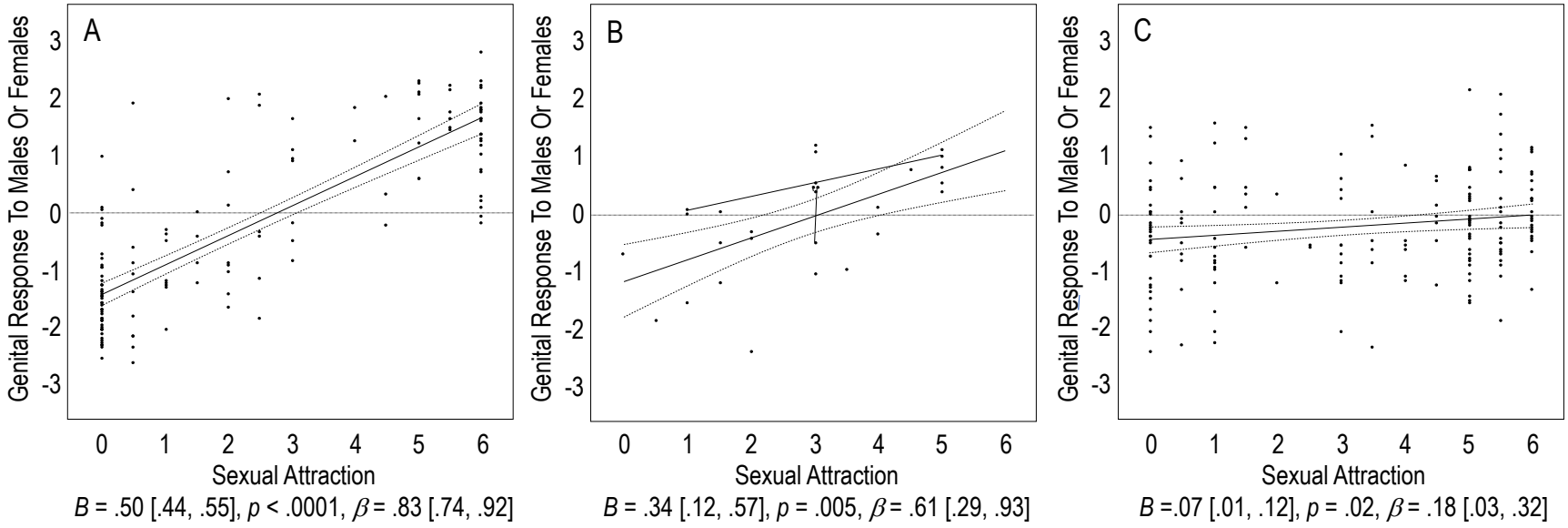

Figure 1. Genital responses to males or females in relation to self-reported sexual attraction in cisgender men (N = 145; A), transgender men (N = 25; B), and cisgender women (N = 178; C). On the x-axis, lower scores indicate more self-reported attraction towards women, 3 an equal bisexual attraction, and higher scores more attraction towards men. On the y-axis, negative scores indicate more genital sexual arousal towards females (standardized within participants), zero equal arousal, and positive scores more arousal towards males. Each dot represents a participant. Solid lines connect data of repeatedly measured participants. Triple lines represent regression estimates with 95% confidence intervals. Statistics represent main effects of sexual attraction on genital sexual arousal to males or females.

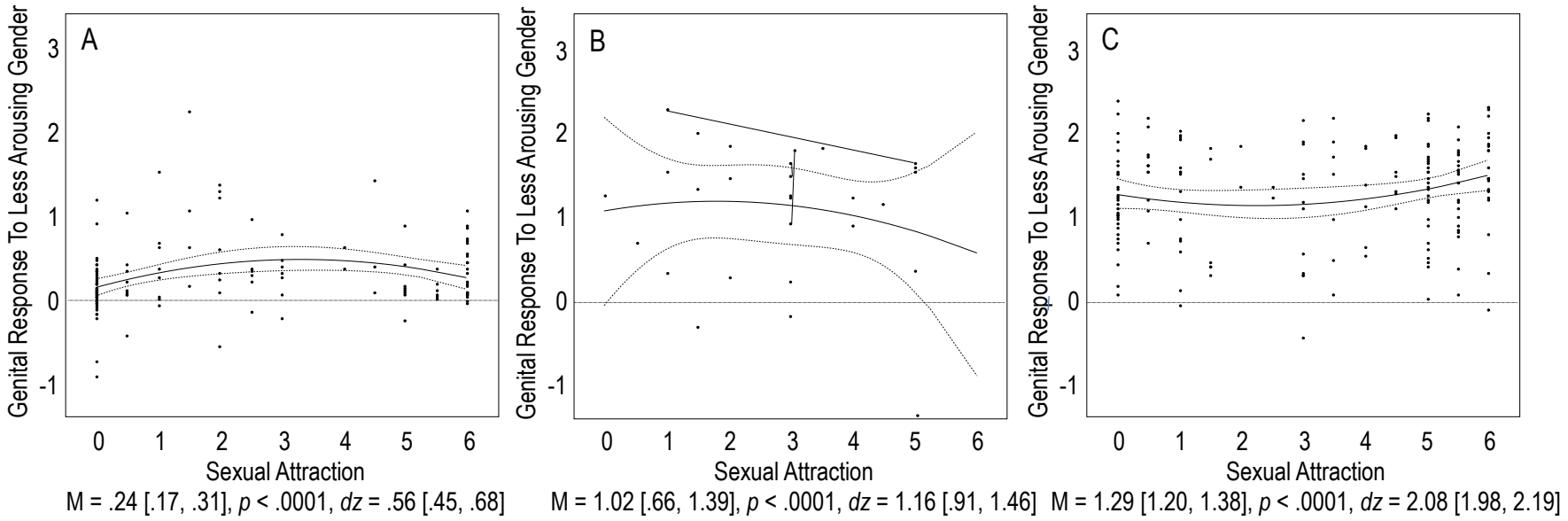

Figure 2. Genital responses to the less-arousing gender in relation to self-reported sexual attraction in cisgender men (N = 145; A), transgender men (N = 25; B), and cisgender women (N = 178; C). On the x-axis, lower scores indicate more self-reported attraction towards women, 3 an equal bisexual attraction, and higher scores more attraction towards men. The y-axis, higher scores indicate stronger genital responses towards the less-arousing gender (standardized within participants). Each dot represents a participant. Solid lines connect data of repeatedly measured participants. Triple lines represent regression estimates with 95% confidence intervals. Statistics represent average responses to the less-arousing gender as compared to baseline (zero).

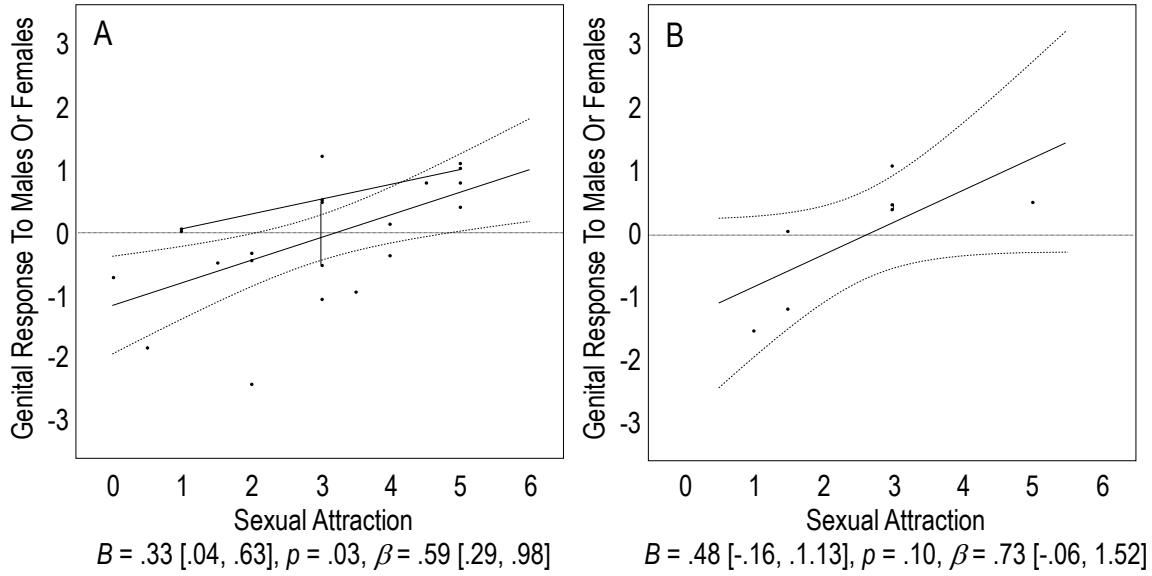

Figure 3. Genital responses to males or females in relation to self-reported sexual attraction in transgender men using the vaginal probe (N = 19; A) and the penile gauge (N = 6; B). On the x-axis, lower scores indicate more self-reported attraction towards women, 3 an equal bisexual attraction, and higher scores more attraction towards men. On the y-axis, negative scores indicate more genital sexual arousal towards females (standardized within participants), zero equal arousal, and positive scores more arousal towards males. Each dot represents a participant. Solid lines connect data of repeatedly measured participants. Triple lines represent regression estimates with 95% confidence intervals. Statistics represent main effects of sexual attraction on genital sexual arousal to males or females.